# lda_analysis_sci

August 23, 2022

[ ]:
```
import numpy as np
import pandas as pd
import seaborn as sns


from moseq2_lda.data import load_representations
from moseq2_lda.model import create_lda_pipeline, run_cross_validation,␣
↪train_lda_pipeline
from moseq2_lda.viz import plot_lda_results, plot_validation_curve,␣
↪plot_permutation_score
#%matplotlib qt
```

[ ]:
```
model_file = r"F:
↪\moseq\2022-07-12-moseq-sci-11-animal-prelim\models\bbs_sci_11_animal_subset_r0T_model_1000
↪p"
index_file = r"F:\moseq\2022-07-12-moseq-sci-11-animal-prelim\moseq2-index.
↪timepoint.yaml"

max_syllable = 73

#groups = ['baseline', '4hrs carrageenan', '24hrs saline', '24hrs meloxicam',␣
↪'baseline meloxicam']
#palette = sns.color_palette(['#35fab3', '#ff8400', '#f06493', '#020887',␣
↪'#647aa3'])
#markers = ['o', 's', '^', 'P', 'X']


#groups = ['baseline', '4hrs carrageenan', '24hrs carrageenan + saline']
#palette = sns.color_palette(['#35fab3', '#ff8400', '#f06493'])
#markers = ['o', 's', '^']
#groups = None
#groups = ['baseline', '4hrs carrageenan', '24hrs carrageenan', '6d␣
↪carrageenan', '14d carrageenan']

#groups = ['baseline', '4hrs carrageenan', '24hrs carrageenan', '6d␣
↪carrageenan', '14d carrageenan', '24hrs carrageenan + saline', '24hrs␣
↪carrageenan + meloxicam']
```

```
#palette = sns.color_palette('deep', n_colors=len(groups))
#markers = ['o', 'v', '^', '<', '>', 's', 'p', 'P', 'D', 'X', '*', 'h', 'H',␣
 ↪'d'][:len(groups)]

groups = [
    'before SCI',
    '2d post-SCI',
    '1w post-SCI',
    '2w post-SCI',
    '3w post-SCI',
    '4w post-SCI',
    '5w post-SCI',
    '6w post-SCI',
    '7w post-SCI',
    '8w post-SCI',
    '9w post-SCI',
    '10w post-SCI',
]


#exclude_uuids = [] # [
#    '2e4fb355-0907-4c6c-9318-11556620a9c0'
#]
```

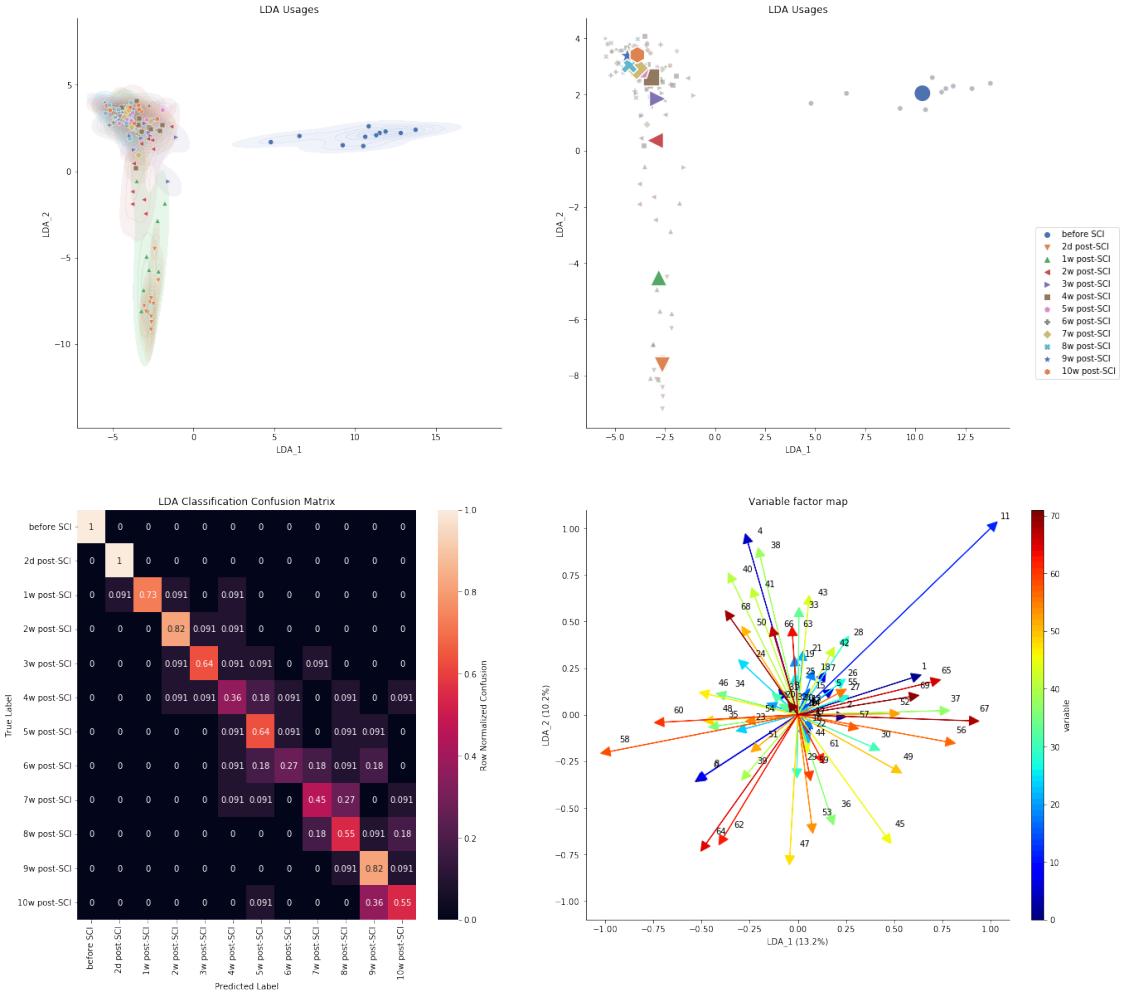
[ ]:
```
representations = load_representations(index_file, model_file, max_syllable=70,␣
 ↪groups=groups)
#groups = list(set(representations.groups))
palette = sns.color_palette('deep', n_colors=len(groups))
markers = ['o', 'v', '^', '<', '>', 's', 'p', 'P', 'D', 'X', '*', 'h', 'H',␣
 ↪'d'][:len(groups)]
```

```
pruned 2396 transitions which are never used
```

[ ]:
```
results = train_lda_pipeline(representations, 'usage')

fig, axs, df = plot_lda_results(results.estimator, representations.usage,␣
 ↪representations.meta, representations.groups, groups, palette, markers,␣
 ↪title='LDA Usages')
```

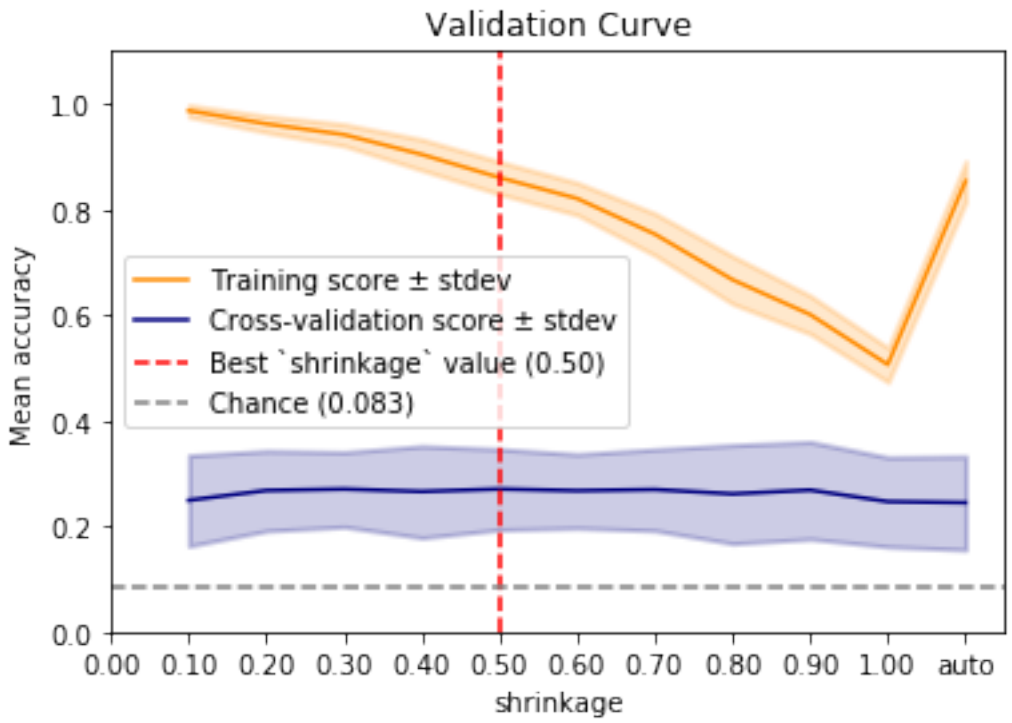
```
Best value for parameter "shrinkage" is 0.50, achieving a mean accuracy of
~27.0% ± 7.63% (stdev) on cross-validated data
Below are performance metrics for estimator using best parameter trained on the
entire training dataset and evaluated on held out test data (not used in cross-
validation)
              precision    recall  f1-score   support
```

```
10w post-SCI       0.00      0.00      0.00         4
 1w post-SCI       1.00      0.33      0.50         3
 2d post-SCI       0.75      1.00      0.86         3
 2w post-SCI       0.50      0.67      0.57         3
 3w post-SCI       0.50      0.25      0.33         4
 4w post-SCI       0.00      0.00      0.00         3
 5w post-SCI       0.00      0.00      0.00         3
 6w post-SCI       0.00      0.00      0.00         4
 7w post-SCI       0.00      0.00      0.00         3
 8w post-SCI       0.20      0.25      0.22         4
 9w post-SCI       0.12      0.33      0.18         3
  before SCI       1.00      1.00      1.00         3

    accuracy                           0.30        40
   macro avg       0.34      0.32      0.31        40
weighted avg       0.32      0.30      0.29        40

LDA Score: 0.6515151515151515
LDA Explained Variance: [0.13213784 0.10189232]
              precision    recall  f1-score   support

10w post-SCI       0.55      0.55      0.55        11
 1w post-SCI       1.00      0.73      0.84        11
 2d post-SCI       0.92      1.00      0.96        11
 2w post-SCI       0.75      0.82      0.78        11
 3w post-SCI       0.78      0.64      0.70        11
 4w post-SCI       0.40      0.36      0.38        11
 5w post-SCI       0.50      0.64      0.56        11
 6w post-SCI       0.60      0.27      0.37        11
 7w post-SCI       0.50      0.45      0.48        11
 8w post-SCI       0.46      0.55      0.50        11
 9w post-SCI       0.53      0.82      0.64        11
  before SCI       1.00      1.00      1.00        11

    accuracy                           0.65       132
   macro avg       0.67      0.65      0.65       132
weighted avg       0.67      0.65      0.65       132
```



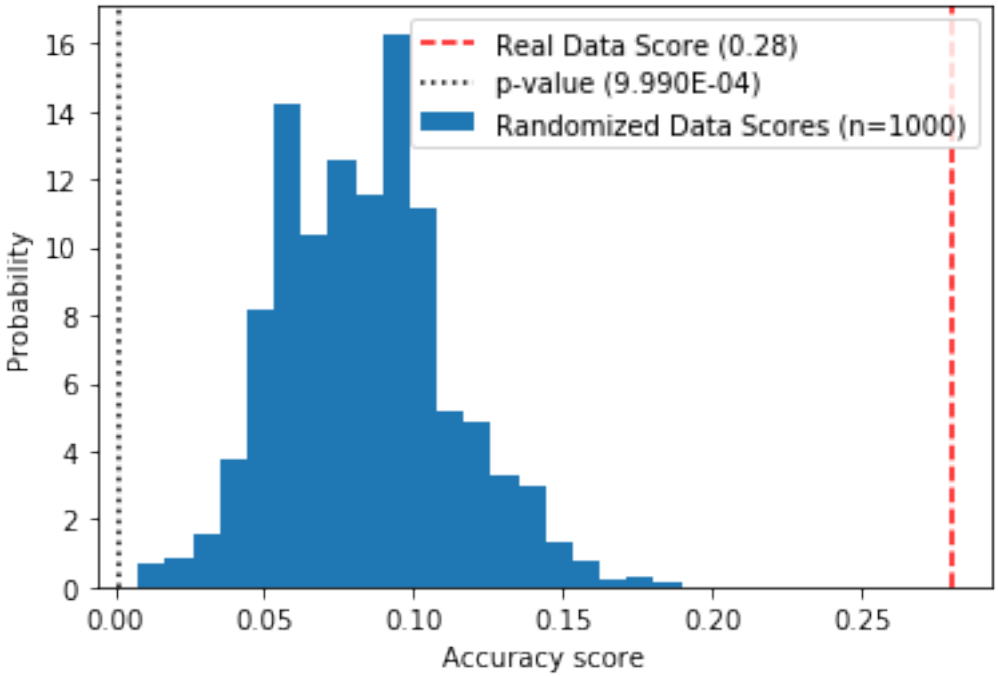

[ ]:
```
plot_validation_curve(results.cv_result)
```

[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x15228db9240>
```




[ ]:
```
plot_permutation_score(results.estimator, results.data.usage, results.data.
↪groups)
```

[ ]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x15229bc7c18>
```


Real Data Score (0.28)
p-value (9.990E-04)
Randomized Data Scores (n=1000)
Probability
Accuracy score
0
2
4
6
8
10
12
14
16
0.00
0.05
0.10
0.15
0.20
0.25

[ ]: